Claim Or Claims

We claim:

1 A method for making a mesoporous metal carbonate structure comprising the steps of:

a. providing a solution containing a non-ionic surfactant and a metal salt having an organic counter ion,

b. adding sufficient base to react with the acidic byproducts to be formed by the addition of carbon dioxide, and

c. adding carbon dioxide, thereby forming a mesoporous metal carbonate structure containing the metal from said metal salt.

2 The method of **Claim 1** further comprising the step of selecting said metal as an alkaline earth metal.

3 The method of **Claim 2** further comprising the step of selecting said alkaline earth metal from the group consisting of Be, Mg, Ca, Sr, Ba, and Ra.

4 The method of **Claim 1** further comprising the step of selecting said metal as a transition metal.

5 The method of **Claim 4** further comprising the step of selecting said transition metal from the group consisting of Ni, Ti, and Zn.

6 The method of **Claim 1** further comprising the step of selecting said metal as an alkali metal.

7 The method of **Claim 6** further comprising the step of selecting said alkali metal as Li.

8 The method of **Claim 1** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent.

9 The method of **Claim 8** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent selected as supercritical carbon dioxide.

10 A mesoporous metal carbonate structure having pores between about 1 nanometer and about 150 nanometers.

11 The mesoporous metal carbonate structure of **Claim 10** wherein said metal is selected as an alkaline earth metal.

12 The mesoporous metal carbonate structure of **Claim 11** wherein said alkaline earth metal is selected from the group consisting of Be, Mg, Ca, Sr, Ba, and Ra.

13 The mesoporous metal carbonate structure of **Claim 10** wherein said metal is selected as a transition metal.

14 The mesoporous metal carbonate structure of **Claim 13** wherein said transition metal is selected from the group consisting of Ni, Ti, and Zn.

15 The mesoporous metal carbonate structure of **Claim 10** wherein said metal is selected as an alkali metal.

16 The mesoporous metal carbonate structure of **Claim 15** wherein said alkali metal is selected as Li.

17 A method for making a mesoporous metal carbonate structure comprising the steps of:

a. providing a solution containing a non-ionic surfactant and a calcium acetate salt,

b. adding sufficient base to react with the acidic byproducts to be formed by the addition of carbon dioxide, and

c. adding carbon dioxide, thereby forming a mesoporous metal carbonate structure containing the metal from said metal salt.

18 The method of **Claim 17** further comprising the step of selecting said metal as an alkaline earth metal.

19 The method of **Claim 18** further comprising the step of selecting said alkaline earth metal from the group consisting of Be, Mg, Ca, Sr, Ba, and Ra.

20 The method of **Claim 17** further comprising the step of selecting said metal as a transition metal.

21 The method of **Claim 20** further comprising the step of selecting said transition metal from the group consisting of Ni, Ti, and Zn.

22 The method of **Claim 17** further comprising the step of selecting said metal as an alkali metal.

23 The method of **Claim 22** further comprising the step of selecting said alkali metal as Li.

24 The method of **Claim 17** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent.

25 The method of **Claim 24** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent selected as supercritical carbon dioxide.